

CLAIMS:

1. A wafer processing device comprising:

a platform for supporting an object to be heated, the platform comprises a substrate having upper and lower relatively flat surfaces, the platform is comprised of
5 graphite;

a shaft extending substantially transverse to the platform, the shaft is comprised of graphite;

a first coating on at least one of the flat surfaces, with said first coating composed of at least a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B,
10 Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

a second coating layer composed of pyrolytic graphite disposed on the first coating in a patterned arrangement of predetermined geometry, the layer having at least two separate ends adapted for forming at least an electrode; and

15 a third coating of a dielectric material superimposed on said first and second coatings, the third coating is composed of at least a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof.

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2. The wafer processing device of claim 1, wherein the device is an electrostatic chuck and the electrode is a chuck electrode.

3. The wafer processing device of claim 1, wherein the device is a heater and the
25 electrode is a heating element electrode.

4. The wafer processing device of claim 1, wherein the graphite platform is one of a disk, a platen, and a cylinder.

5. The wafer processing device of claim 1, wherein the graphite shaft is one of a rod and a hollow core.

6. The wafer processing device of claim 1, wherein the second coating is patterned to form a continuous elongated strip of pyrolytic graphite arranged in at least one of electrical flow path has at least one of a spiral pattern, a serpentine pattern, a helical pattern, a zigzag pattern, a continuous labyrinthine pattern, a spirally coiled pattern, a swirled pattern, a randomly convoluted pattern, and combinations thereof.

7. The wafer processing device of claim 6, wherein the patterned second coating is formed on said lower surface of said platform.

8. The wafer processing device of claim 1, wherein said pyrolytic graphite second coating layer is encapsulated in at least a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and rare earth metals, or complexes and / or combinations thereof.

9. The wafer processing device of claim 8, wherein said pyrolytic graphite second coating layer is encapsulated in AlN or pyrolytic boron nitride.

10. The wafer processing device of claim 1, wherein the graphite shaft and the graphite platform form a single unitary body.

11. The wafer processing device of claim 1, wherein the graphite shaft further includes at least two electrical conductors for connecting the electrode to an external source of power.

12. The wafer processing device of claim 11, wherein the two electrical conductors are concentric with the first electrical conductor being disposed within the second electrical conductor.

5 13. The wafer processing device of claim 11, wherein the two electrical conductors are symmetrically disposed on opposite sides of the graphite shaft.

14. The wafer processing device of claim 13, wherein said shaft is essentially solid and said two electrical conductors are coated layers symmetrically disposed on opposite sides of said graphite shaft.

15. The wafer processing device of claim 11, wherein said shaft has a hollow core and said two electrical conductors are disposed within the shaft, and wherein the two electrical conductors are concentric.

10 16. The wafer processing device of claim 15, wherein the two concentric electrical conductors have a common center.

17. The wafer processing device of claim 11, wherein said first electrical conductor is in a form of a graphite rod, the second electrical conductor is a hollow graphite rod, and wherein the first and second electrical conductors are separated by
15 means of a coating layer comprising a material selected from the group of least a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and rare earth metals, or complexes and / or combinations thereof.

20 18. The wafer processing device of claim 11, comprising at least two electrical conductors connect the at least one electrode to an external source of power, and wherein:

each electrical conductor having an end adapted for connecting to the external source of power, and

the end of each of the electrical conductors is coated with at least a ceramic paste comprising at least one of a piezoelectric ceramic paste, a plasticiser, a conductor, and combinations thereof.

19. A wafer processing device comprising:

a platform for supporting an object to be heated, the platform comprising a substrate having upper and lower relatively flat surfaces, the platform is composed of graphite, and the platform having at least a contact hole bore through the platform;

at least a shaft extending substantially transverse to the platform, said shaft is inserted through the contact hole in the platform for coupling with said platform;

a first coating on at least one of the flat surfaces, with said first coating composed of a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

a second coating layer composed of pyrolytic graphite disposed on the first coating in a patterned arrangement of predetermined geometry, the layer having at least two separate ends adapted for forming at least an electrode;

a third coating superimposed on said first and second coatings, the third coating is composed of at least a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

wherein the contact hole in the platform has a substantially radiused edge.

20. The wafer processing device of claim 19, wherein a ball mill is used to bore the contact hole.

21. The wafer processing device of claim 19, wherein the shaft and the platform are diffusion bonded.

22. A wafer processing device comprising:

5 a platform for supporting an object to be heated, the platform comprises a substrate having upper and lower relatively flat surfaces, the platform is comprised of graphite;

at least a shaft extending substantially transverse to the platform;

a first coating on at least one of the flat surfaces, with said first coating
10 composed of a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

a second coating layer composed of pyrolytic graphite disposed on the first coating in a patterned arrangement of predetermined geometry, the layer having at
15 least two separate ends adapted for forming at least an electrode;

a third coating superimposed on said first and second coatings, the third coating is composed of at least a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

at least two electrical conductors disposed within the shaft for connecting the heating element electrodes to an external source of power;

a plurality of connection posts for connecting the separate ends of the heating element electrodes with the electrical connectors disposed within the shaft;

wherein the connection posts are comprised of a carbon fiber composite material.

23. A wafer processing device comprising:

a platform for supporting an object to be heated, the platform comprises a substrate having upper and lower relatively flat surfaces, the platform is comprised of graphite;

at least a shaft extending substantially transverse to the platform;

5 a first coating on at least one of the flat surfaces, with said first coating composed of a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

10 a second coating layer composed of pyrolytic graphite disposed on the first coating in a patterned arrangement of predetermined geometry, the layer having two separate ends adapted for forming heating element electrodes;

a third coating superimposed on said first and second coatings, the third coating is composed of at least a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof; and

at least two electrical conductors disposed within the shaft for connecting the heating element electrodes to an external source of power, said at least two electrical connectors are arranged within one another to form an essentially solid shaft.

24. A wafer processing device comprising:

15 a platform for supporting an object to be heated, the platform comprises a substrate having upper and lower relatively flat surfaces, the platform is comprised of graphite;

at least a shaft with a shaft length extending substantially transverse to the platform;

20 a first coating on at least one of the flat surfaces, with said first coating composed of a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

a second coating layer composed of pyrolytic graphite disposed on the first coating and on at least a portion of the shaft, the second coating layer forms a patterned arrangement of predetermined geometry, the layer having two separate ends adapted for forming at least an electrode;

a third coating superimposed on said first and second coatings, the third coating is composed of at least a material selected from the group consisting of a nitride, carbide, carbonitride or oxynitride of elements selected from a group consisting of B, Al, Si, Ga, refractory hard metals, transition metals, and combinations thereof;

at least two electrical conductors disposed within the shaft for connecting the at least an electrode to an external source of power.

5 25. The wafer processing device of claim 24, wherein the second coating layer extends downward at least 5% of the shaft length to cover at least a portion of the shaft.

10 26. The wafer processing device of claim 25, wherein the second coating layer extends downward at least 10% of the shaft length to cover at least a portion of the shaft.